

Improving the supply chain performance of the on-site daily lectures in an academic institution.

Evangelos Ergen, ergen@ergen.gr
<http://www.ergen.gr>

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Abstract: The emergence of entrepreneurial oriented academic institutions is expected to be the next challenge for the education itself in global terms. Recent facts in United Kingdom, the pole of qualitative education, prove that more convergence has to take place among academia and the market. In order for an academic institution to acquire a market-driven orientation, this sets among others the implementation of operations through strategic and operational logistics approach. In other words, the essence of supply chain, transforms the institute to a performance-driven academic organisation. This paper is an attempt to analyse and evaluate the supply chain performance of the daily lectures as an academic activity in an educational institute, from the perspective of administrative procedures. There is an effort to identify any possible malfunctions or areas that could be improved regarding the performance on the final delivered service to the students, which is considered "the class". The backbone of any academic program is the delivery of its modules, and how these are structured and communicated-transferred to the students. At this point, in an academic institution, there are three major entities involved and these are: (a) the academic staff, (b) the students, and (c) the administration. The contribution of the last is crucial since it undertakes the full responsibility of creating and maintaining the framework where the academics and students will meet for the educational process. Literature review is accommodated in all phases of this analysis and evaluation. A special focus has been given to the review of non-financial performance measurements, mostly related to issues of customer service and procurement. We acknowledge that this study has to cope with a number of difficulties since there were no adequate literature findings on logistics in education. Nevertheless, a synthesis of different, but close-related sectors, were additionally adopted and researched. Furthermore, they were combined with the education and the delivery of classes especially, in order to support the different aspects of the supply chain performance.

In this study, it is aimed to introduce a number of key performance indicators which could critically affect the performance of the institution. Through the acquisition and implementation of such indicators, it is expected to increase the services offered not only to students, and create added value to the service experience of education. Moreover, such approach could create opportunities for further improvements in parallel areas and meet future challenges. The main idea is to support the business plan of the institution by transforming its strategies to everyday measurable acts. In an environment of continuous changes, it is rather obligatory for academic institutions to accommodate benchmarking and performance indicators as a mean for long-term success and sustainable development.

Keywords: supply chain, performance indicators, KPIs, academic institution, non-financial measures

1. INTRODUCTION

In this section we aim to give a description of the defined service which is the delivery of the modules and the supply chain of it. In the next section there is an attempt to demonstrate the upstream and downstream supply chain of the academic institution, focusing on the service experience that this paper stands for. In section three, there is an analysis and evaluation of the areas of customer service and procurement which are considered as the most significant of the specific supply chain. The analysis is performed from the logistics point of view. In the fourth section, there is an extended literature review on non-financial measures and performance indicators. In the fifth section this study concentrates in the recommendation of key performance indicators (KPIs) and examines their impact on the academic institution. To be precise, there is a recommendation on a set of KPIs as tools for performance measurement which are expected to improve the service experience of the delivery of lectures and identify the strengths and weaknesses of the administrative procedures.

The defined service is the delivery of the lectures to students and the environment that embraces this educational process from the administrative perspective. There is a focus on all aspects that have to be present in order to maintain the quality and the serviceability in this daily process, and achieve high standards throughout the whole academic year. In order to better realise the supply chain of the lectures, right below is given a model of how this is perceived:

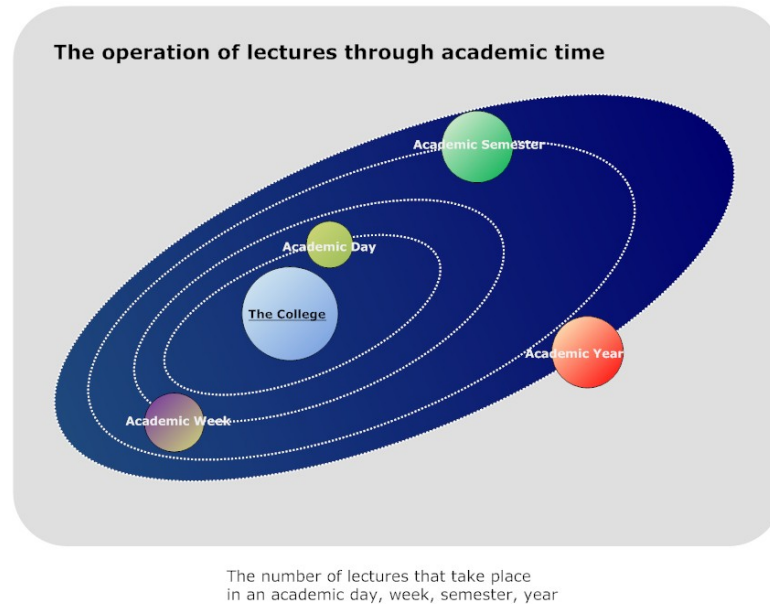


Figure 1. The operation of lectures through academic time

The educational service experience is a timeless operation. Nevertheless, in order to better approach it, for measuring purposes, we have split it into specific periods, which are: (a) the academic day, (b) the academic week, (c) the academic semester, and (d) the academic year. This segmentation helps later in the use of key performance indicators.

The core operation of this experience is the lecture. Actually, the lecture is part of a bigger supply chain the one of the supply chain of an academic course. The academic course includes a number of modules and each module is delivered to the students through the delivery of the lectures, which we try to measure in this paper. There is an attempt to illustrate this chain in the diagram right below:



Figure 2. The immediate supply chain of an academic course (in brief)

The actual delivery of the course includes a predefined number of modules. Each module is transferred to students through a series of lectures. The lectures have specific duration and are taken place on daily basis. Therefore, there is a clear relation among: lectures-modules-courses. In this study we focus in the first tier of the chain which is the lectures.

2. THE UPSTREAM AND DOWNSTREAM SUPPLY CHAIN

On the one side, the education process involves moving forward people, services and information. On the other side, the participating entities in this non-stop process have to be coordinated for effective performance and measurable results. According to Aho (*European Commission, 2006*), to achieve innovation this implies business performance, which should be measurable. Therefore, you cannot evaluate if you cannot measure.

First of all, there is an effort to illustrate the upstream and downstream supply chain of the lectures delivery in the institution. The internal supply chain refers to the internal operations that take place for the delivery of classes on a daily basis. As downstream supply chain is considered mainly the students body but also all other entities that participate directly or indirectly (lecturers, alumni, parents etc.). Due to the sector particularities, since this study approaches the supply chain from the administrative side, the academic staff could be considered as part of the downstream supply chain as well. As upstream supply chain could be defined the network of suppliers of the institution in terms of any kind of material related to the premises and the tools used during the lectures (audio-visual equipment, technical material, use of other material, premises, clean and safety etc.).

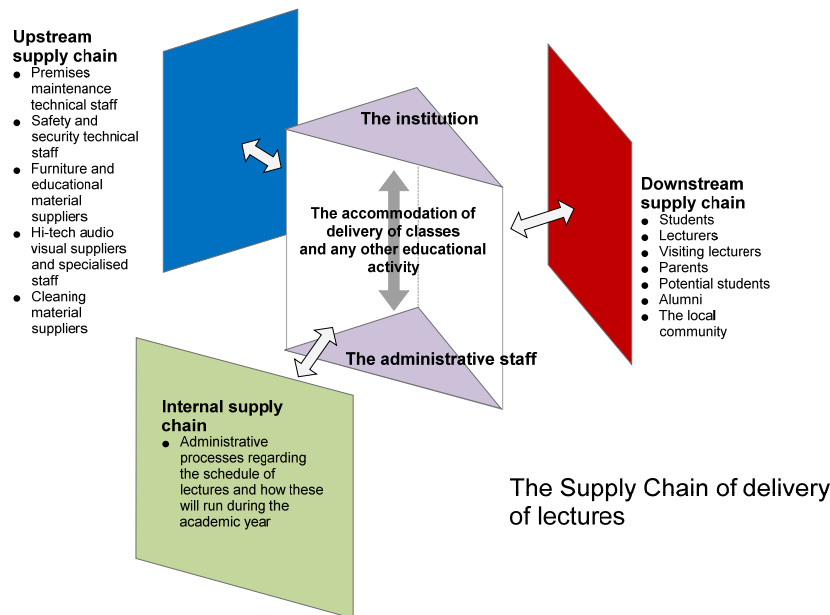


Figure 3. The upstream and downstream supply chain from the lectures perspective

Adoption of information technology and late evolvments are well-adopted by the institution contributing in the development of logistics. The first-tier suppliers considered as a top priority of the institution and a stable network is established which is on close cooperation with the administrative staff. Priorities are: fast and effective service, cost control and qualitative approach. The aim is to deliver classes with convenience, distinctiveness and quality. There is an effort of shifting the channel power from suppliers to the institution, through a specific framework of cooperation which corresponds to the good communication and clear demands.

As *Chan et al (2006)* highlighted, the downstream and upstream operations in supply chain can be used for the implementation of knowledge-based future approaches. Adopting a simulation tactic, this may reduce risks and increase guidance.

One of the most important objectives for the administration is using effectively this supply chain, to achieve the synchronisation and alignment with the schedule of classes, in order to support successfully the delivery of intangible things to students. The supply chain does not cope only with the educational process itself, but also with the perceptions of students and academic staff as well.

Although the result of the educational process is intangible, the delivery of lectures is a mix of tangible and intangible things. Moreover, to cope with the typical supply chain problems of inability to deliver things that support classes on time, the administration gives focus in quality and cost. This supply chain is used, among others, for the diffusion of knowledge within the organisation, since it is the backbone of the operations. Building a clear supply chain network, in the institution, is expected to result in an advanced environment of serviceability and competitiveness.

As *Bradley (2001)* asserted, accelerating information flow and compressing cycle times can help reduce forecast uncertainty in the supply chain.

Actually, the performance measures are utilised to examine and improve such supply chains in order to transform them into useful components of the organisation. Therefore, they add value and increase the wealth through collaboration and efficiency.

3. CUSTOMER SERVICE & PROCUREMENT

Similar to the products, the good customer service in terms of lectures' delivery is the availability. Students must experience the principal of having access in their classes according to the schedule each semester. In case of postponing of a class, this is scheduled to be replaced in a convenient time and within the academic requirements. More or less this is similar to the distribution of the product, where product is the lecture and distribution is the actual performance of the lecturer with the involvement of students (process experience).

The significance of logistics is demonstrated in the effort of the administration to achieve quick responses to students' and lecturers' requests for better services in classes. Moreover, since the educational process is an experience service, there is an increased demand for personal

customisation regarding each request and response. Through such achievements, and by providing time and place utilities or solutions, the administration tends to add value in the whole educational package that a student experiences. The next figure demonstrates the management of logistics in terms of lectures:

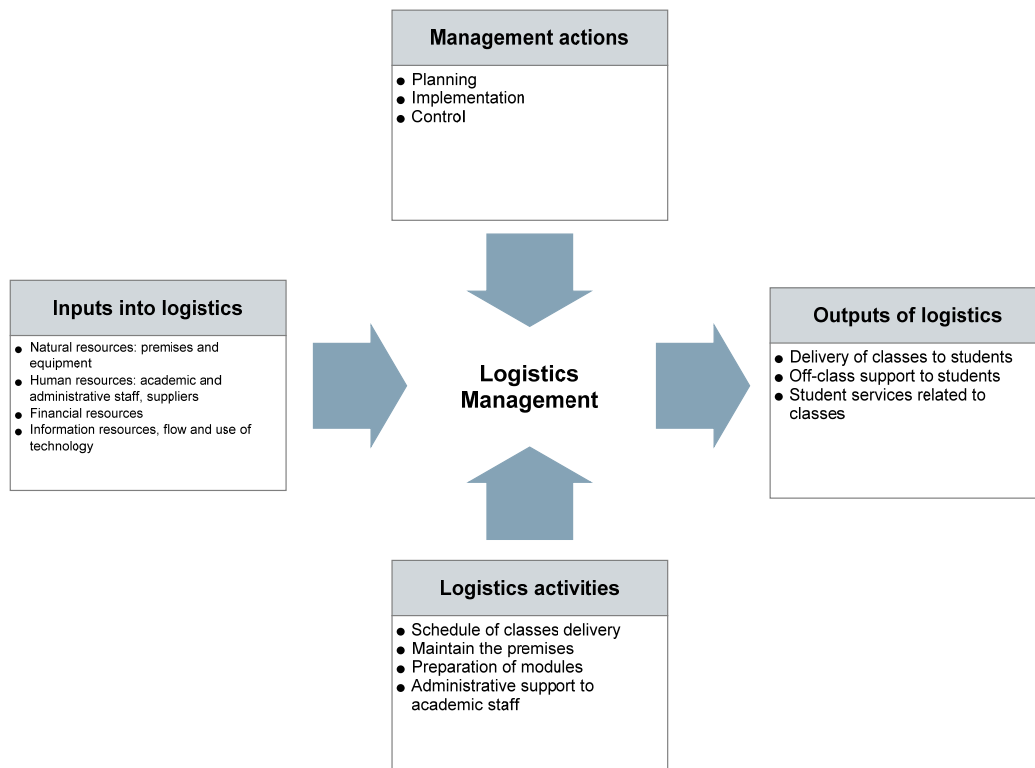


Figure 4. The management of logistics in lectures

The above could be evaluated if measured somehow. Therefore, logistics could be a key to an increased standard of lectures' delivery. In addition, in case of a multicultural environment, administration takes into account the diversity of the students' body and interprets their demands through the filter of cultural differences. Customer service incorporates customer satisfaction and customer success which means that students as end-users of the system, if satisfied, will develop a customer loyalty which will be translated into new customers.

Customer service and procurement are derivatives of customers and suppliers accordingly. The logistics strategy is aggressive and is unrelated to the product life cycle of a course. On the contrary, when classes of a new-introduced course are taking place the strategy should be at its utmost aggressive. This is a radical difference between other products and services and the educational service. Usually the product life cycle phenomenon has an influence on distribution strategy (Michaelides, 2011). Nevertheless, the Pareto's law has no absolute application in education. It is true that, in general, classes have the same delivery in terms of support but there is always a chance for more demands. The institution is a service business from the logistics perspective, where actually are offered both facilities-based and field-based services since students may experience part of the offered services in their personal environment. In order to better realise the specialties of the service offered by the institution, there is a description of both the characteristics and the risks, from the customer service perspective. In addition the same approach finds application in the procurement field, since suppliers of the institution have direct involvement.

The characteristics of "class delivery" as a service:

- value perception
- treatment of the student
- convenience of the service

- quality of the tangible goods
- unique skills that constitute the service offering

The risk characteristics of the service:

- The administration has a clear operating focus trying to support the service with a robust and structured manner to maintain consistent performance.
- There is a weakness in the links between the back office, which is the technical staff and the front office, which is the secretariat where it is identified a delay in the feedback.
- The point is that students have to see immediately the value of the service provided and experience fast improvements and obvious actions from the administration side.

The administration should alter the procurement priorities and adapt them to the customer service demands following the model given right below which illustrates the new customer service and procurement policy:

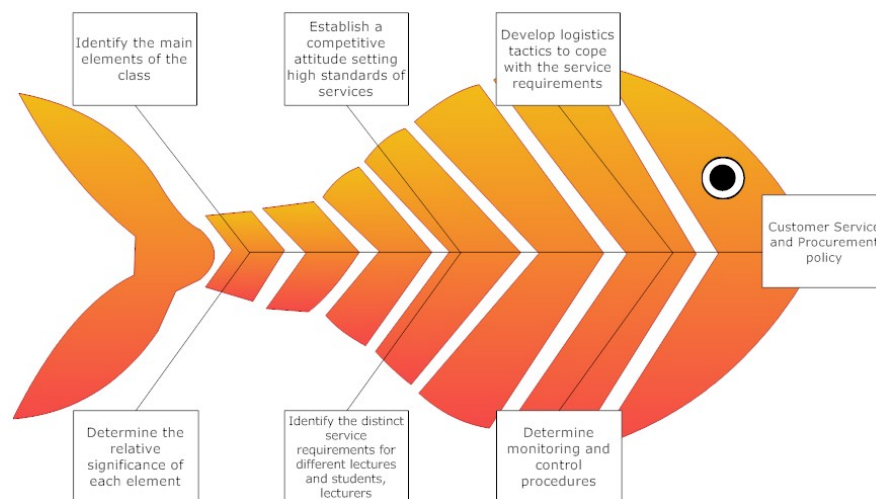


Figure 5. The Customer Service and Procurement policy

4. LITERATURE REVIEW ON NON-FINANCIAL PERFORMANCE MEASUREMENTS

As Roy *et al* (2000) claimed, the management of company's resources may direct either to success or failure in a competitive environment. The successful management implies competitive advantage. Therefore, business logistics are linked to the business objectives exercising direct impact on the overall performance. Obviously, there is a double-view approach in logistics in terms of supply chain and this is from the strategic and the operational side. At this point, performance measures bridge the two sides and reveal any information that could help both ways. Parrett (2007) claimed that non-financial information provides insight into operations and this affects the long-term sustainability and growth of the organisation. Similarly, Jochem and Geers (2010) highlighted that performance indicators on quality based activities, reflects indirectly the added-value of an organisation and its economic success. Moreover, Ponikvar *et al* (2009) related performance ratios and measures with business decisions and growth rates.

According to Yuan *et al* (2009) the performance objectives and the key performance indicators (KPIs) can be used to identify the strengths and weaknesses of a project while additionally serve as tools for effective performance management. Among others, KPIs have to satisfy the different needs and expectations of the involved parties, such as the College Management Committee, the academic departments and the administration who evaluate and confront with the results. There is an interesting framework which correlates the performance indicators with knowledge and describes their development in regards to the business strategy of an organisation, and is given in Appendix A (Roy *et al*, 2000). The performance-measures are depended to the environment within they operate. It is worth to mention what Ponikvar *et al* (2009) concluded. The performance measures have to be scrutinised through two factors: (a) if they are comparable with the industry,

and (b) if the size structure of the industry is important in order to make decisions based on performance ratios.

As *Ndlovu (2010)* claimed the wealth creation is associated with intangible and non-financial resources within dynamic markets. In any case performance indicators should be aligned to the institute's strategy and strategic objectives. The College's Administration has a clear strategy of a continuous increase in the serviceability and the quality of services offered to students and lecturers on daily basis. The introduction of KPIs is upgrading the role of measurement within the academic environment. Moreover, these can be the mean to (a) monitor the specific's strategy implementation, (b) communicate the strategy within the College, (c) provide incentives and create an environment of appraisal, (d) evaluate actions related to strategy (*Ndlovu, 2010*).

On the other side, *Pojasek (2009)* differentiated the KPIs and the non-financial measures, in leading and lagging, trying to link them with sustainability reporting. Leading indicators are the ones to monitor the effectiveness and give advance warning of any weakness or inadequacy. Lagging indicators measure the final outcomes. As a result, they are not used for proactive actions but rather for evaluation and definition of a procedure as a successful or unsuccessful. In addition, according to *Gjerde and Hughes (2009)*, the leading indicators are related to the key performance drivers (KPDs) which focus on key business processes, while the lagging indicators are related to the key performance outcomes (KPOs) that focus on what have been achieved. Thus, KPOs will help the top management in planning and control.

Nevertheless, the non-financial metrics are translated into tangible returns (*Parrett, 2007*). It is crucial though to identify that simplistic metrics can be misleading (*O'Brien, 2008*). Through literature review it was identified that there is an issue between KPIs that reflect past activities and the ones signalling future performance (*Gjerde and Hughes, 2009*).

There is an interesting model presented by *Neely and Adams (2001)*, the performance prism model (*Appendix B*), which investigates the performance from five facets: (a) stakeholder satisfaction, (b) strategies, (c) processes, (d) capabilities, and (e) stakeholder contribution. This model could be adapted in this study regarding the introduction of KPIs. All five facets could be used to establish the prism under which the institution will apply the KPIs in the delivery of lectures.

Besides that, *Chatterji and Levine (2006)* stated that the goal of non-financial performance measurement is, to align managerial incentives with long-term shareholder value. In addition, they have placed the social aspect in this statement by concluding that non-financial measures help to better align the shareholder value creation with social value creation. Similarly, the specific measures could be widely applicable to education and educational process.

5. THE ADOPTION OF PERFORMANCE INDICATORS AND THEIR IMPACT

Once an organisation has analysed its mission, identified all its stakeholders and defined its goals, it needs a way to measure progress toward those goals (*Reh, 2011*). Key performance indicators are quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organisation (*Reh, 2011*).

According to *Taylor (2009)*, it is not always easy to measure the things that are the most important. *Vitezic and Riedl (2005)* claimed that the appropriate performance measurement system is the one which enables an organisation to direct its actions toward achieving strategic and operational goals. The aim is to identify though, at this case, a number of KPIs that could measure both qualitative and quantitative procedures in the supply chain of lectures that take place during the semester in the institution.

As *Ibanez and Rosanas (2010)* stated, indicators could be helpers or hindrances depending on how they are incorporated in the philosophy of the organisation. Measures are technical instruments that must be interpreted using judgement and prudence.

The adoption of performance indicators prepares the institution to be a market-driven organisation, ready to cope with changes that most of the times are embedded by the political and economic environment. According to *Guthrie and Neumann (2007)*, this reform implies the adoption of rationalisation, economies of scale and focus on efficiency. As a result, the institute demonstrates greater market responsiveness and acquires a business culture based on marketization of activities. From a strategic view, KPIs help in the alignment to the strategy. These are tools to identify and redefine procedures and objectives.

There is always to consider though, the degree of control that an institute would like to have over the inputs, outputs and outcomes. Moreover, the reliability and the interpretation of results are two more issues for concern. In the *Receivables Report (2010)*, it was identified that tracking performance indicators is only the half job done. The results have to be compared with others from

competition, or the sector's overall, in order to gain a value and create a framework of responsibilities. This is benchmarking, otherwise it is simply statistics. The usual comparison though, remains with the data of previous times so as the organisation to acquire a comparable knowledge of its results through time.

On the other side a performance-based institute is in line with performance budget funding. There is an issue to examine, how the organisational scope will be related to the specific type of performance indicators to be used (Gibbs et al, 2009). The performance indicators actually will represent a sub-system within the existed one of the organisation which should be evaluated under the prism of risk, distortion and manipulability. Besides that, according to Taylor (2001), when employees identify the KPIs as a crucial part of their job they tend to select and prioritise the tasks around the KPIs omitting others. Such exceeding concentration creates distortions and overpasses equal value operations.

Nevertheless, the construction of performance indicators is difficult but in the internal administrative procedures this could be administered effectively through the adoption of logistics concern. Moreover, the indicators to survive are usually accompanied by a performance-based reward system.

In any case the adoption of performance indicators should comply with the strategic objectives of the institution and align its actions for decision making. In the next figure, it is illustrated the model that could ingrain the performance system as this is introduced by the College's administration.

Decision Making process for our service delivery

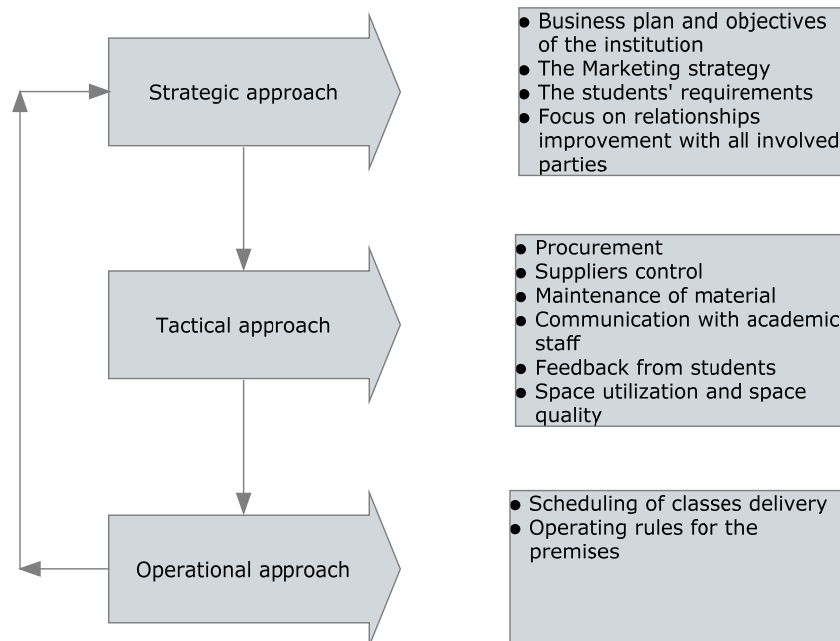


Figure 6. The logistics approach for performance indicators and decision making

This three-pronged approach could be the basis to establish and expand the performance measures throughout the time.

As Jacobs and Goddard (2007) stated, performance indicators might have implications both for policy and practice in an organisation. The decision rules for indicators need to be treated with caution. Their weight and significance should be evaluated from time-to-time taking into account any changes in the environment. In addition, indicators should always include the factor of uncertainty in order to communicate the sensitivity of the reported measure. Moreover, Hermann et

al (2010) highlighted that key performance indicators are closely related with business performance but most important with entrepreneurial orientation. Thus, it is identified that, if education as a service experience, would change its direction to entrepreneurial paths; this imposes the adoption of KPIs. Dynamic environments open up opportunities, in education sector as well.

In addition, *Dadzie et al (2005)* raised the relation between KPIs, customer service and customer loyalty. The improved logistics services create a positive impact and maintain an essence of safety and loyalty for the customer which is proved through increased customer responsiveness.

KPIs provide a snapshot of the institution's specific business processes. They should be renewed and revised since they follow a certain life cycle. *Skibniewski and Ghosh (2009)* demonstrated the conceptual KPI life cycle which is given below:

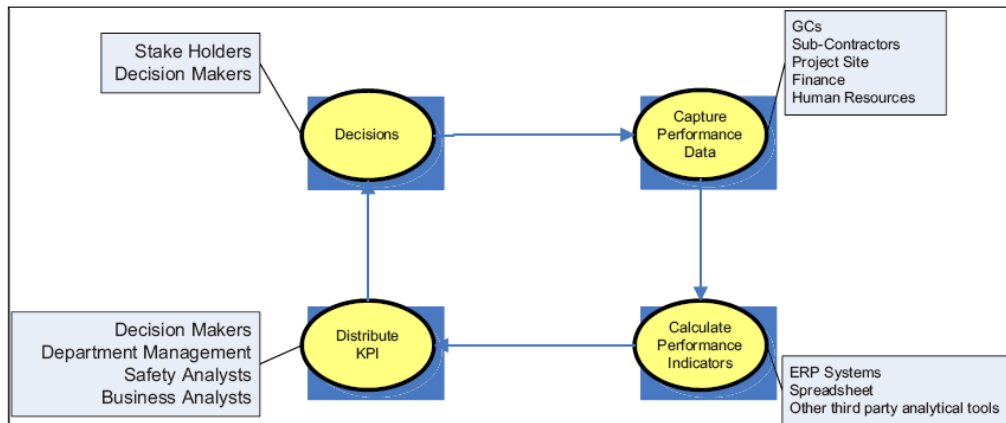


Figure 7. Conceptual KPI life cycle

(Source: Skibniewski, J. Mirosław and Ghosh, Saumyendu (2009) Determination of Key Performance Indicators with Enterprise Resource Planning Systems in Engineering Construction Firms. *Journal of Construction Engineering and Management*, October 2009, p.974)

Although this is a more business oriented model, it could be adapted in the institution's needs for applying performance measures and is a tool for the KPIs that are recommended in the next section.

5.1 Recommendation of KPIs

The key performance indicators that are recommended apply in both the customer service and the procurement processes. Adopting the survey of *Yuan et al (2009)*, in order to establish a certain framework of KPIs, it is necessary to define a conceptual model first. This conceptual model will connect the strategic level with the operational level. The suggested model should consist of five components and the KPIs will examine the supply chain from five different perspectives:

- a) the physical characteristics and tangible status of the service;
- b) the financing side;
- c) the marketing side;
- d) the innovation and learning; and
- e) the project's processes.

The indicators should be measurable so they have to be quantified. Also there must be some ways to avoid any biases or distortions that usually derive from the processes and change the final result. In addition these indicators might be interrelated; therefore administration should evaluate their relationship and take into account possible imbalances.

Moreover it is suggested to take into account the taxonomy of KPIs as this is presented in *Appendix C* which explains the types of KPIs and their purpose. According to *Skibniewski and Ghosh (2009)*, a key performance indicator has two dimensions: (a) the knowledge specificity and (b) the time specificity.

Such guides are adopted for both categories of indicators.

5.1.1 KPIs for customer service business processes

% attendance rate per module; it measures the participation of students in the lectures of a module; the measure is daily and it will be comparable through time and different modules. This index is measured on weekly basis.

number of students per class; it measures the students that enrolled in a course to attend the lectures. This index is measured on academic semester basis.

% classroom utilization rate; it measures the relation between students-seats available in a lecture session. This index is measured on academic semester basis.

% lectures requiring technology access; it measures the necessity for hi-tech means in order for the lectures to take place effectively. The percentage corresponds to the overall need of the institution.

% students' satisfaction with the use of technology and quality of premises during lectures; it measures the overall satisfaction of students of the presence of education means. The percentage is measured on academic semester basis.

% lecturers' satisfaction with the use of technology and quality of premises during lectures; it measures the overall satisfaction of academic staff of the presence of education means and support of the administration. The percentage is measured on academic semester basis.

% institution spending on educational resources related to lectures' operation; it measures the percentage of the total annual budget that the institution spends for hi-tech equipment, educational means for the classes, premises renovation etc. The percentage is measured on annual basis.

% employees involved in the premises maintenance and improvement; it measures the number of employees that have direct involvement in the management of premises and equipment. It is measured on annual basis.

lecture hours delivered from total planned; it measures the number of lectures that did take place as well as the ones that did not take place. This is measured on weekly basis.

The specific indicators are focused in the satisfaction and effective operation of the supply chain from the perspective of customers. At this point, as customers are considered students, and academic staff.

5.1.2 KPIs for procurement business processes

time sensitive reaction in problem solving of the network of technical staff (on-time delivery); it measures, how fast the network of technical staff (outsourced) reacts in any problem during the day. This is measured each time an incident takes place.

relation between the cost of each supplier and the quality of the supplies-services offered (conformance); it measures the cost-benefit that the institution receives from the cooperation with every supplier, in terms of satisfaction-complaints from the end-service, the repetition and the necessity to cooperate with the specific supplier. This is measured on weekly basis.

repeated major incidents that cause downtime in the lectures delivery; it measures any technical discrepancies that create problems in the infrastructure and good operation of facilities and premises in order for the lectures to take place according to standards. This is measured on daily basis.

% IT work outsourced; it measures the amount of IT work outsourced out of the total IT support from the internal department of the institution. It refers to classes, labs, lecturers' demands and maintenance of relevant infrastructure. This is measured on semester basis.

% service level: it measures the rate at which a service has been accomplished at a certain level from that expected. This is measured every time this happens.

% cost of procurement compared to general budget: it measures the percentage that the institution spends in the network of suppliers. This is measured on annual basis.

The indicators are more focused in quality and delivery reliability, since the external network contribute crucially to the end-service of the institution.

CONCLUSIONS

Supply chain is a source of opportunity but also for threats. The administration could focus on developing a supply chain wide technology strategy, act strategically and listen to the signals from students. Also the administration could act and give fast solutions to problems that are internally generated. Activate the bullwhip solutions mostly in terms of sharing data from each secretariat (through Communities of Practice), collaboratively plan and act, enhance trust and build relationships, share information and knowledge.

At this stage, the administration could create a competitive advantage for the institution through the effective use of logistics supply chain and could add value in the educational experience. Mainly this is depending on internal service differentiation and advantage sustainability. As *Wadhwa et al (2009)* highlighted, it is crucial to observe the whole supply chain and not examine independent nodes. Therefore, the administration, through the adoption of the recommended KPIs, is expected to contribute in the decision making process of top management, as they create an overall model.

The education process has common links with public administration and governmental procedures since participating entities are involved for a certain period of their lives getting experiences, shaping personalities and building future aspects.

The introduction and implementation of key performance indicators is expected to monitor and give feedback to the top management about its strategies. In addition, may be used as a useful tool for the increase of business performance and in result adds value to the final service offered to students and academics as well. The role of administration is expected to be upgraded and the contribution to the institution's brand equity will be crucial.

Non-financial measures catch up and most of the times reveal the hidden value of the service while in parallel prepare the institution for embracing the uncertainty since they provide agility and a wide prism for approaching threats and opportunities.

REFERENCES

- Aho, Esko (2006) Creating an Innovative Europe. *Technical Report of European Commission*, January 2006, EUR 22005, pp. 1-25.
- Bradley, Peter (2001) Supply Chain Perspective: The Certainty of Uncertainty. *Supply Chain Management Review*, March-April 2001, pp. 105-106.
- Chan, Y. L. et al (2006) Knowledge-based simulation and analysis of supply chain performance. *International Journal of Computer Integrated Manufacturing*, 19(1), pp. 14-23.
- Gibbs, M. J. et al (2009) Performance measure properties and incentive system design, *Journal of Industrial Relations*, 48, pp. 237-264.
- Chatterji, Aaron and Levine, David (2006) Breaking down the wall of codes: Evaluating non-financial performance measurement. *California Management Review*, 48(2), pp. 29-51.
- Dadzie, Q. Kofi et al (2005) Customer service in the internet-enabled logistics supply chain: Website design antecedents and loyalty effects. *Journal of Business Logistics*, 26(1), pp. 53-78.
- Gjerde, Paulson A. Kathy and Hughes, B. Susan (2009) Racing to success by identifying key performance drivers. *The Journal of Corporate Accounting & Finance*, March/April 2009, pp. 59-65.
- Guthrie, James and Neumann, Ruth (2007) Economic and non-financial performance indicators in universities. *Public Management Review*, 9(2), pp. 231-252.
- Hermann, Frank et al (2010) Entrepreneurial orientation and Business performance – A replication study. *Schmalenbach Business Review*, 62, pp. 175-198.

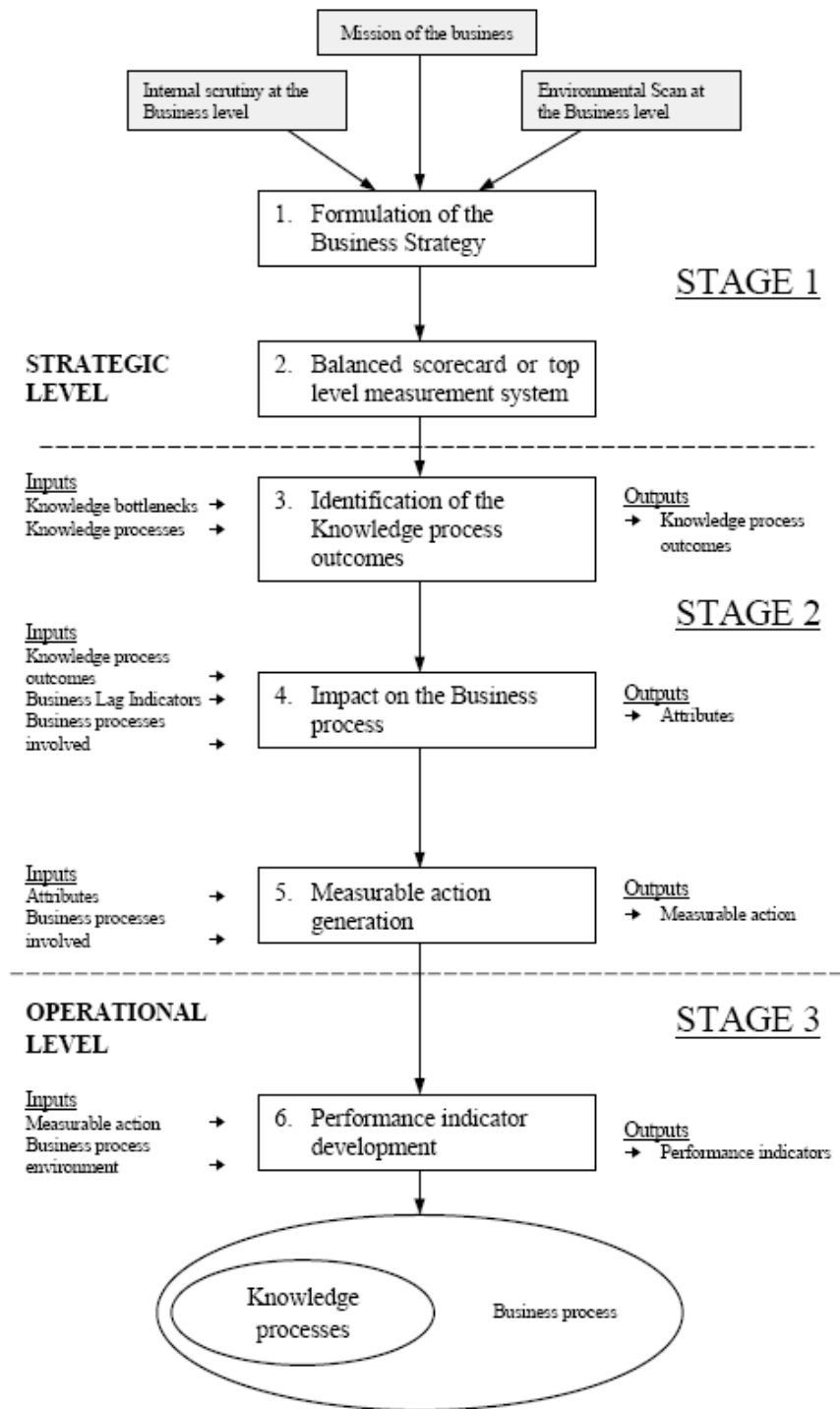
- Ibanez, Raul and Rosanas, Josep (2010) Use your tools wisely. Indicators: Helpers or Hindrances? *Expert Insight*, Second Quarter 2010, pp., 52-58.
- Jacobs, Rowena and Goddard, Maria (2007) How do performance indicators add up? An examination of composite indicators in public services. *Journal of Public Money and Management*, April 2007, pp. 103-110.
- Jochem, Roland and Geers, Dennis (2010) Quality oriented value and performance drivers. *Journal of Modern Accounting & Editing*, 6(10), pp. 52-63.
- Michaelides, Z. (2011) Logistics, Supply Chain Product and Customer Service. *Notes on Logistics and Supply Chain Management module, Executive MBA CITY College Faculty of the University of Sheffield*, March 2011.
- Ndlovu, Stephen (2010) Non-Financial Performance measures within public companies – A Literature Review. *Advances in Accounting, Finance and Economics*, 3(1), pp. 1-12.
- Neely, A.D. and Adams, C.A. (2001) The performance prism perspective. *Journal of Cost Management*, January-February 2001, pp. 7-15.
- O'Brien, Justin (2008) Measuring Regulation and Regulatory Performance: Benchmarking through Key Performance Indicators. *The Economic Society of Australia-Economic Papers*, Special Edition, pp. 70-82.
- Parrett, G. William (2007) Non-Financial Metrics and Boards. *The Corporate Board*, November-December 2007, pp. 1-7.
- Pojasek, B. Robert (2009) Quality Toolbox: Using Leading Indicators to drive sustainability performance. *Environmental Quality Management*, Summer 2009, pp. 87-93.
- Ponikvar, Nina et al (2009) Performance ratios for managerial decision-making in a growing firm. *Journal of Business Economics and Management*, 10(2), pp. 109-120.
- Reh, John (2011) Key Performance Indicators: How an organisation defines and measures progress toward its goals, *Western Sydney Institute, Technical Report in About.com*, pp. 1-3.
- Roy, Rajkumar et al (2000) A Framework to create performance indicators in knowledge management. *Proceedings of the Third International Conference on Practical Aspects of Knowledge Management*, Basel Switzerland, 30-31 Oct., pp. 18-1;18-8.
- Skibniewski, J. Miroslaw and Ghosh, Saumyendu (2009) Determination of Key Performance Indicators with Enterprise Resource Planning Systems in Engineering Construction Firms. *Journal of Construction Engineering and Management*, October 2009, pp. 965-978.
- SmartKPIs.com, <http://www.smartkpis.com/key-performance-indicator-KPI>, accessed on 01 April 2011.
- Taylor, J. (2001) The impact of performance indicators on the work of university academics: evidence from Australian universities. *Higher Education Quarterly*, 55, pp. 42-61.
- Taylor, J. (2009) Strengthening the link between performance measurement and decision making. *The Journal of Public Administration*, 87(4), pp. 853-871.
- The Receivables Report (2010) The Value of Key Performance Indicators: How and What to Measure. *The America's Health Care Financial Managers*, May 2010, pp. 6-8.
- Vitezic, Neda and Knes-Riedl, Jozica (2005) The use of non-financial measures in decision making process of enterprises performance in transition economy. *Proceedings of the Sixth International Conference on Enterprise in Transition*, pp. 247-259.
- Wadhwa, Subhash et al (2009) Inventory performance of some supply chain inventory policies under impulse demands. *International Journal of Production Research*, 47(12), pp. 3307-3332.
- Yuan, Jingfeng et al (2009) Selection of performance objectives and key performance indicators in public-private partnership projects to achieve value for money. *Construction Management and Economics*, 27, pp. 253-270.

BIBLIOGRAPHY

- Ballou, H. Ronald (2004) *Business Logistics Supply Chain Management*. Fifth Edition, London Prentice Hall.
- Barlow, Rick Dana (2010) Effective downstream, upstream supply chain planning aids budget yield. *Healthcare purchasing news*, December 2010, pp. 10-14.
- Chen, J. I. and Paulraj A. (2004) Understanding supply chain management: critical research and a theoretical framework. *International Journal of Production Research*, 42(1), pp. 131-163.
- Cohen, Shoshanah and Roussel, Joseph (2005) *Strategic Supply Chain Management*. McGraw Hill, USA.

- Crisan, Emil et al (2010) Management best practices used in Romanian Logistics Customer Service Planning. *Amfiteatru Economic*, XII(27), pp. 215-227.
- Croson, Rachel and Donohue, Karen (2005) Upstream versus downstream information and its impact on the bullwhip effect. *Journal of System Dynamics Review*, 21, pp. 249-260.
- Editorial staff (2009) Services Procurement: Getting the most out of your business intelligence. *Supply and Demand Chain Executive*, February-March 2009, pp. 19-21.
- Hfmap (2009) Developing a culture of revenue cycle excellence. *Healthcare Financial Management*, Fall 2009, pp. 5-9.
- Gebauer, Judith et al (1998) Impact of the internet on procurement. *Acquisition Review Quarterly*, February 1998, pp. 1-13.
- Holdsworth, Mark (2010) Growing revenue and reducing churn: the case for service quality optimization. *Journal of Telecommunications Management*, 3(3), pp. 231-237.
- Hugos, Michael (2003) *Essentials of Supply Chain Management*. Wiley & Sons Publications, USA.
- Kelly, Martin (2004) How to set benchmarks and measuring key performance indicators. *Supply Chain Planet*, pp. 1-4.
- Mandave, H. A. and Khodke, P. M. (2010) Vendor Rating: A tool for quality in supply chain management. *The IUP Journal of Supply Chain Management*, VII(3), pp. 41-48.
- Missopoulos, F. (2011) Business Logistics, Supply Chain – A vital subject. *Notes on Logistics and Supply Chain Management module, Executive MBA CITY College Faculty of the University of Sheffield*, March 2011.
- Moor, Aldo and Smits, Martin (2002) Key performance indicators for knowledge management in a community of practice. *Metis Project D7.2, Tilburg University, White paper*, pp. 1-30.
- Parmenter, David (2007) *Key Performance Indicators*. Wiley & Sons Publications, USA.
- Rabhi, Mohamed (2009) How do key performance indicators metrics help advance knowledge management and ensure its sustainability? *Proceedings of the International Conference in Intellectual Capital, Knowledge Management and Organizational Learning*, pp. 381-386.
- Santanna, Rogerio (2009) How to use ICTs to provide better services to citizens: Brazil's e-Procurement. *I-Ways Journal of E-Government Policy and Regulation*, 32, pp. 23-28.
- Scannell, V. Thomas et al (2000) Upstream supply chain management and competitive performance in the automotive supply industry. *Journal of Business Logistics*, 21(1), pp. 23-48.
- Tatikonda, V. Mohan and Stock, N. Gregory (2003) Product technology transfer in the upstream supply chain. *The Journal of Product Innovation Management*, 20, pp. 444-467.
- Zhao, Xiande et al (2001) Improving the supply chain performance: use of forecasting models versus early order commitments. *International Journal of Production Research*, 39(17), pp. 3923-3939.

APPENDIX A
Performance Indicators and Knowledge

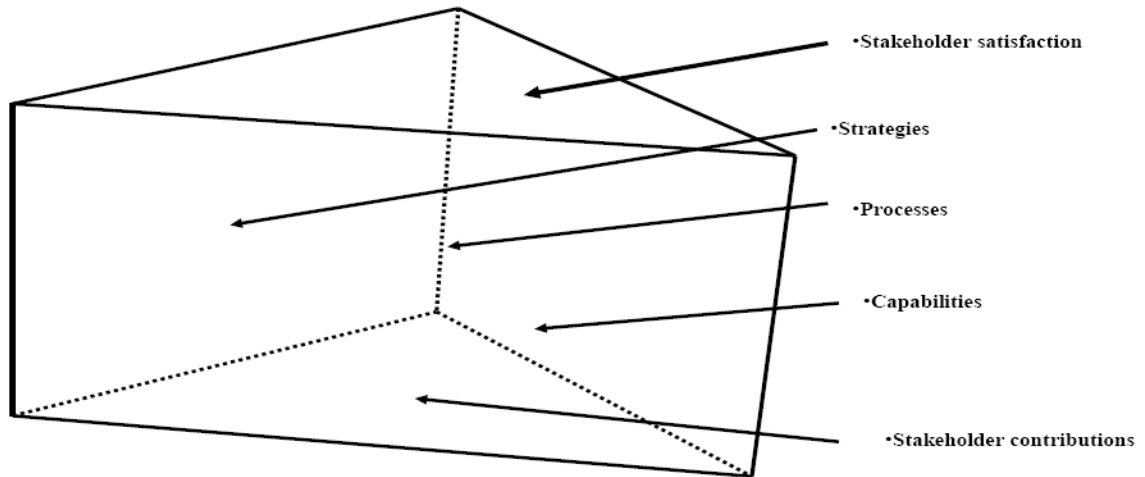


(Source: Roy, Rajkumar et al (2000) A Framework to create performance indicators in knowledge management. *Proceedings of the Third International Conference on Practical Aspects of Knowledge Management*, Basel Switzerland, 30-31 Oct., p. 18-5).

APPENDIX B
The Performance Prism Model

THE PERFORMANCE PRISM MODEL

The Five Facets



(Source: Neely, A.D. and Adams, C.A. (2001) The performance prism perspective.
Journal of Cost Management, January-February 2001, pp. 7-15).

APPENDIX C

Types of KPIs – A taxonomy

The following list provides an explanation of several popular terms characterizing KPIs

Leading KPI - Drive the performance of the outcome measure, being predictor of success or failure.. Examples of leading indicators are: "%Employees involved in the innovation process", "% Conversion rate", or "%Inventory quality ratio (IQR).

Lagging KPI - Type of indicator that reflect the success or failure after an event has been consumed. Examples include: "\$ Operating profit per room", "\$ Earnings before interest and taxes (EBIT)", or "\$ Cost avoidance savings".

Input KPI - Reflects assets and resources invested in or used to generate business results. Examples include: "# Headcount", "\$ Cost per broadcast hour" and "# Knowledge materials distributed to employees".

Process KPI - Refers to the efficiency or productivity of a business process. Examples include: "# Product-repair cycle time," "% On time delivery" "# Conflicts arose during the project", "# Average call handling time", and "# Mean time to repair".

Output KPI - Measures the financial and nonfinancial results of business activities. Examples include: "\$ Bonus payout", "# New customers acquired", or "\$ Revenue per successful call"

Outcome KPI - Reflects overall results or impact of the business activity in terms of generated benefits, as a quantification of performance. Examples include: "% Customer retention", "% Employee turnover" or "% Brand awareness"

Qualitative KPI - A descriptive characteristic, an opinion, a property or a trait. The most common ones gauge customer or employee satisfaction through surveys. While the survey data itself is quantitative, the measures are based on a subjective interpretation of a customer's or employee's opinions.

Quantitative KPI - A measurable characteristic, resulted by counting, adding, or averaging numbers. Quantitative data is most common in measurement and therefore forms the backbone of most KPIs. Operational systems that manage inventory, supply chain, purchasing, orders, accounting, financial systems, all gather quantitative data by means of KPIs. Other examples of quantitative KPIs are "# Employee tenure", "# Units per man-hour" or "# Maintenance backlog"

Functional area KPI - A KPI that is relevant for an organizational main capability and is valid across multiple organization typed and industries.

Industry KPI - A KPI that is specific for a particular line of operations or industry

(Source: SmartKPIs.com, <http://www.smartkpis.com/key-performance-indicator-KPI>, accessed on 01 April 2011)